FINAL INSPECTIONS AND FINAL APPROVAL

(Local Health Department Activities)

A **Final Inspection** is an on-site assessment of a newly completed water well/pump system to determine if:

1. The water well location and visible components of the well and water supply system comply with the State Well Code and local water well permit conditions.

2. Abandoned wells have been plugged.

A Predrilling Site Review and Random Construction Inspection (made during well construction) are not Final Inspections because they occur before the water system is completed.

The ***minimum*** items checked and activities performed during a Final Inspection are:

1. Water well location to ensure adequate separation from contamination sources.

2. Casing termination method (pitless adapter, well house, basement offset) and well cap.

3. Visual check of sealing of annular space surrounding the water well casing.

4. Water system component materials (water well casing, water service line, etc.)

5. Pump installation (pump, pressure tank, piping, sample tap, valves, and controls).

6. Collection of bacteriological water sample (by owner or owner's authorized representative) and nitrate/partial chemical analysis is recommended.

7. Plugging abandoned water wells at replacement water well sites.

Contractor generated affidavits, where the responsibility for determining State Well Code compliance rests with the regulated industry, cannot be used to satisfy Final Inspection requirements.

If code violations are frequently observed while performing Final Inspections, increasing the rate of Final Inspections can bring about improved compliance. Sanitarians should complete the *Water Supply Final Inspection Checklist (see enclosed)*, or an equivalent, for each Final Inspection.

FIELD INSPECTION PROCEDURES

Paperwork to Review and Bring:

- ✓ well permit
- ✓ well log
- ✓ deviation documentation
- ✓ isolation distance requirements
- ✓ field inspection form

Tools to Bring:

- ✓ 100 ft. tape or wheel and 12 ft. tape
- ✓ grout probe (only if suspicious of problem)
- ✓ shovel or soil auger
- ✓ bentonite (if grout probing)
- ✓ flashlight
- ✓ chlorine test kit (if taking samples)

"As-Built" Sketch of Property:

- ✓ locate it on the well permit or final inspection form
- ✓ locate correct sewage disposal system location
- ✓ locate sources of contamination
  - o septic tanks and drainfields (current and future)
  - o sewers
  - o underground and aboveground storage tanks
  - o barnyards
  - o surface water
- ✓ locate existing well – has it been properly plugged?

An **Approval** is a communication (letter, inspection tag, finalized permit, or other document) to the water well owner from the LHD that the newly completed water system is suitable for the intended use. All of the following must occur before a water supply system approval can be issued:

1. the well construction meets code
2. the water well record is satisfactory
3. the bacteriological sample is satisfactory

WATER SUPPLY FINAL INSPECTION CHECKLIST

Owner_____ Site Address _____

Permit Number _____

A. Water Well Location Approved? ☐ YES ☐ NO

1. Same location as approved on permit? ☐ YES ☐ NO
(If "No," make drawing showing location)

2. Properly isolated from contamination sources (standard and major)? ☐ YES ☐ NO

3. Accessible for maintenance/repair? ☐ YES ☐ NO

B. Wellhead/Casing Termination Approved? ☐ YES ☐ NO

1. Method:

Pitless adapter ____ Well house ____ Basement offset _____ Other _____

2. Wellhead

a. 12 inches above grade? ☐ YES ☐ NO

b. Approved well cap/seal? ☐ YES ☐ NO

c. Approved conduit (grey Schedule 40 PVC or galvanized pipe)? ☐ YES ☐ NO ☐ NA

d. Caving of soil or open annulus around casing? ☐ YES ☐ NO

C. Grouting Approved? ☐ YES ☐ NO

1. Verified on water well record review? ☐ YES ☐ NO

2. Field observation of grouting? ☐ YES ☐ NO

D. Pump Installation Approved? ☐ YES ☐ NO

1. Location? In well ____ On top of well ____ Basement offset ____ Well house _____
Other _____

2. Type? Submersible ____Deep well jet ____ Shallow well jet ____Constant Pressure ____
Other _____

E. Piping Between Well and House Approved? ☐ YES ☐ NO

1. Material? Plastic: PVC _____ PE _____Other _____
NSF-pw marking ☐ YES ☐ NO

Minimum 160 psi pressure rating ☐ YES ☐ NO

2. Diameter _____ inches

3. Protected suction line? ☐ YES ☐ NO ☐ NA

4. For submersible pump installations, is check valve installed within well casing? ☐ YES ☐ NO ☐ NA

F. Pressure Tank Installation Approved? ☐ YES ☐ NO

1. Type: Captive air ____ Galvanized ____ Buried ____

2. Number of tanks _____

3. Pressure relief valve installed? ☐ YES ☐ NO

G. Sampling Tap Approved? ☐ YES ☐ NO

H. Water Samples Collected? ☐ YES ☐ NO

1. Type: Bacteriological _____Partial Chemical _____Nitrate/nitrite _____
VOC ____ Other _____

2. Sample(s) collected by: LHD _____Owner _____Water Well driller _____
Other _____

Comments:_____
_____
_____
_____
_____
_____

Inspected by _____ Date: _____ Reinspection Date: _____

Have the permit conditions been met? ☐ YES ☐ NO

Is the water well record accurate and complete? ☐ YES ☐ NO

Does the system comply with the State Well Code? ☐ YES ☐ NO

Is there a safe coliform bacteria sample? ☐ YES ☐ NO

Does any other water sampling meet acceptable levels? ☐ YES ☐ NO ☐ NA

The water well system is approved ☐ ***YES*** ☐ ***NO***

Reviewed by_____ Date _____

How to Conduct an Investigation on an Existing Water Supply

This outline was prepared to aid the sanitarian in conducting a complete evaluation of an existing water supply.

Office Investigation

1. Identify exact location of well on county map or plat book.
2. Geological study of the area (well records, groundwater database information, geological maps, hydrogeological studies, etc.)
3. Locate well record for well in question.
4. Review facility file.
5. Review bacti and partial chemistry history of the water supply.
6. Contact well driller(s) for well construction details for area wells if no well records are available for immediate vicinity.
7. Contact owner to make arrangements for investigation. This may include removal of pump or exposure of pitiess adapter (by the owner). If investigation involves temporary shutdown of pumping equipment, owner should be notified so arrangement for an alternate water supply can be made,
8. Prepare materials used for field evaluation.
    a. Sanitary survey forms
    b. Flashlight
    c. Mirror
    d. Allen wrenches and standard wrenches
    e. Pliers
    f. Grout probe (soil probe with extensions)
    g. Shovel
    h. Electromagnet with battery
    i. Magnetic locater (for locating buried piping, septic tanks, etc.)
    j. Bacti and partial chemical sample bodies
    k. Tape measure (100 ft. and 12 ft.)
    1. Drop string with weight
    m. Fluorescent dye

Field Investigation

1. Determine number of wells located on property. Ask owner if there are any abandoned wells at the site.

2. Review any records the owner may have or record information from the owner regarding the water supply (drilling contractors billing invoice, repair bills, well record, etc.)

3. Survey the well site and prepare a sketch on the survey form, including:
    a. Location of potential contamination sources, including but not limited to:
        I. septic tank, drainfield, dry well, etc.
        II. building sewer, sewer main
        III. fuel tanks (buried or abovegrade)
        IV. storm sewers
        V. barnyards, animal feedlots
        VI. chemical storage (pesticides, herbicides, etc.)
    b. Location of buildings
    c. Location of well(s) and isolation distances from contamination sources.

d. Road and driveway locations.
e. Water service line location.
f. Utility line locations (buried or abovegrade)
g. Property lines.
h. Surface water (ponds, lakes, rivers, ditches).
i. Prominent topographic features (hills, knolls, gentle sloping, etc.).
j. Arrow noting north direction.

4. Pump details
   a. Type of pump (submersible, deep well jet, shallow well jet, hand pump).
   b. Brand name, model number and horsepower (obtain this information from the pump data plate and motor data plate).
   c. Rated pumping capacity (obtain this by referring to manufacturers pump curve, if brand and model are known).

5. Pump installation
   a. Location of pump.
   b. Pump setting or drop pipe length.
   c. Check valve locations.
   d. Piping materials (type and specification markings).
   e. Protection around buried suction lines.
      I. back pressurization of annular space in concentric piping where required.
      II. draining of concentric piping into basement where permitted.
   f. Electrical wiring installation.

6. Pressure tank
   a. Type of pressure tank (galvanized steel, bladder, diaphragm).
   b. Number of pressure tanks.
   c. System operating range (from pressure gauge or look at pressure switch for operating range).
   d. Brand name and model number.
   e. Total tank capacity and tank drawdown (available from manufacturers sizing charts, if brand and model are known).
   f. Record measured tank dimensions, if brand and model are not available.
   g. Note if pressure tank is waterlogged.

7. Pressure tank installation
   a. Location of tank.
   b. Piping layout.
   c. Pressure switch.
   d. Pressure gauge (is it functioning?)
   e. Pressure relief valve.
   f. Sampling tap near tank (high enough to permit sampling?)
   g. Check valve location.

8. Distribution system
   a. Water service line and distribution piping rnaterial (copper, galvanized steel, PVC, PB) - ASTM markings - pressure ratings - NSF-pw (potable water) certification.
   b. Check for leaks, corrosion and other maintenance problems.

c. Cross-connection survey (submerged inlets, unapproved yard hydrants, boiler feed lines, hosebibbs, water closets, etc.)

9. Water treatment devices
   a. What type of treatment, if any, is present? softening, iron removal, aeration/fitration, reverse osmosis, distillation, chlorination, ultraviolet disinfection, carbon filtration).
   b. Are the treatment devices adequately maintained and functioning properly?
   c. Were the treatment devices installed to treat aesthetic water quality problems or bacteriological, nitrates, volatile organic compounds or other compounds of public health concern?
   d. Record the brand and model name of any treatment equipment.

10. Pitless adapter installation
   a. Attempt to move upper casing laterally to determine if pitless unit is fake.
   b. Determine type (weld-on adapter, clamp-on adapter, thread-on unit).
   c. Determine brand name and model. Since pitless adapters and well caps are sold together, this can usually be determined by checking well cap for manufacturer's name. Becoming familiar with the various makes and models available will help the sanitarian evaluate pitless adapters.
   d. If trench is open, inspect the connection to the casing for leaks. For weld-on adapters, carefully check integrity of welds for watertightness.
   e. To check for leaks into casing, the following procedure may be used.
      I. Flood the excavation so water is standing above the point of connection to the casing.
      II. Check inside of casing for infiltration of water.
      III. Fluorescent dye may also be placed in excavation as a leak tracer.

11. Well caps and seals
   a. Is cap or seal intact and free of cracks or severe corrosion?
   b. Check well cap for presence of screened vent and proper vent construction, where required.
   c. Check to see if vent is unobstructed and functioning. (This can be done by running pump and checking for inward air movement during pumping and outward air movement during well recovery).
   d. Check caps and sanitary seals to see if they are securely attached to casing.
   e. If vent is unscreened (e.g., old-style overlapping cap), remove cap and check for evidence of insects on underside of cap or in well casing.
   f. Check for secure attachment between well cap and protective electrical conduit.
   g. Check for tight seal between drop pipe and sanitary seal.

   WARNING: Beware of loose electrical connections under caps on submersible pump installations.

12. Well casing
   a. Examine the outside of the casing to determine if there are any cracks, corrosion, etc.
   b. Examine interior of casing with flashlight or mirror when well cap is removed.
   c. Determine casing material (black steel, galvanized steel, or SDR21 or SDR 17 PVC).
   d. Note any casing markings that may be visible (ASTM specifications, weight per foot, wall thickness, manufacturer or supplier name).

13. Well diameter
    a. Measure with tape (common well casing sizes are noted by inside pipe diameter measurement of outside diameter will be slightly larger - e.g , 4- inch well casing is 4.026 in. I.D. and 4.5 in. O.D.)
    b. Upper casing size on thread-on pitless units will be 1- inch larger than nominal casing size (e.g., a 2- inch well will have a 3-inch upper casing.)

14. Depth
    a. Can be measured with weighted drop string or tape after pump and drop pipe have been removed from well.
       WARNING: Do not put anything into well unless all internal components (drop pipe, pump) have been removed.
    b. Usually measured only during problem investigations.

15. Casing depth (bedrock wells only)
    a. Can be measured using an electromagnet after pump and drop pipe have been removed from well.
    b. Usually measured only during problem investigations.

16. Grouting
    a. Grouting is best evaluated during actual grouting operation. This allows the sanitarian to determine if grout is being placed from bottom up to surface and the total depth of grouting. Evaluation after well is complete is best done while the excavation to install the pitless adapter is still open or immediately upon completion of the well. Grout from the surface to 5 foot below grade is usually removed during pitless adapter installation.
    b. In high bedrock areas, it may be necessary to have the homeowner excavate to the top of the bedrock to evaluate grouting. This allows evaluation of the seal at the bedrock/overburden interface.
    c. Check material around the casing below the pitless unit. If evaluation is done prior to pitless adapter installation, there will often be grouting material visible on the ground surface around the well casing.
        I. Neat Cement - If grouting material is neat cement, a shovel may be used to expose a few feet of the grout, but generally the total depth of grouting cannot be determined. Neat cement will appear as a hard, rock-like material, gray to greenish-gray in color.
        II. Bentonite grout- An acceptable bentonite grout will appear as a pliable clay with a peanut butter or gelatin consistency, gray to brownish-gray in color. If granular or coarse grade bentonite were used, the individual particle configuration maybe recognized. An unacceptable bentonite drilling mud slurry will appear as a watery clay mixture, tan to gray in color. A shovel or soil probe can be used to evaluate bentonite grouts.
        III. Evaluation using soil probe - **To reduce the risk of electrocution, it is recommended that probes be used for occasional field checks and to focus on wells that the local health department has reason to believe may not have been grouted. The Michigan Department of Environmental Quality advises that probing be limited to installations where the pump has not yet been installed. Lock Out/Tag Out procedures, on the electrical box, pursuant under MIOSHA regulations must be followed when probing after**

the pump is installed. A hollow-core soil probe with extensions can be used to evaluate grouting, and collect grout samples. The probe is forced into the ground keeping the probe in contact with the casing. If a pitless adapter is present, and the excavation is not open, the probe should be started a few inches from the casing, and at an angle so the end of the probe will contact the casing below the pitless adapter. Once the probe is below the pitless adapter, it should be removed and the solid material removed from the probe barrel. The probe is then reinserted and a sample of material from the annular space below the pitless adapter is collected. The probe should be run a few more feet, then a sample brought up to surface again for examination. In some cases it is possible to probe to depths in excess of 25 feet, especially where the annular space has not been grouted, however, gravel boulders, casing couplings, or other obstructions may prohibit advancement of the probe. Where an open annular space exists or where drilling mud is present in the annular space, the probe may fall freely or with little effort. Holes created by the probe should be filled in by slowly pouring granular bentonite.

NOTE: Beware of buried electrical lines (especially around wells with submersible pumps) when using the probe.

d. For wells in high bedrock areas, where the casing length is relatively short 25-35 feet, or where it is suspected to be less than 25 feet, examination inside the well may determine if there is a leakage problem due to leak of grouting. Look down the casing using a flashlight or mirror to determine if any water is cascading off the end of the well casing. It may be necessary to operate the pump to lower the water level a few feet below the casing. If water is cascading off the end of the casing, grouting is either not present or considered inadequate. This evaluation procedure may not be possible in all wells due to variations in pitless adapter design and casing diameter.

e. A tracer dye may be placed in an excavation around a well to detect leakage in the annular space. Place powdered fluorescein dye around the well and flood the excavation. Pump the well for an extended period of time and keep the excavation flooded. The presence of visible dye in the well water indicates a defective seal around the casing. If no dye is visible, a sample should be collected in a partial chemical bottle and submitted to the Michigan Department of Environmental Quality lab for fluorescein dye analysis. The inability to detect fluorescein dye does not mean that the annular space is adequately sealed, since many factors (e.g. well depth, pumping length, well efficiency, interactions of dye with solid, etc.) influence the effectiveness of this method. Success is more likely in fractured, high bedrock areas.

17. Note any unusual features such as flow of water around casing (loss of confining formation on flowing well), open annulus space or depression around well casing.

18. Disinfect the water supply if pump or drop pipe were removed or if any equipment was placed into the well during the investigation.

19. Collect bacteriological and partial chemical samples where appropriate.

PROCEDURES FOR FIELD EVALUATION OF PUMP CAPACITY

Introduction

Simple field procedures may be utilized by the sanitarian to estimate well production and evaluate pressure tank function. This information is essential for determining if a water supply will adequately meet demands within the facility. Determination of pump capacity should become a routine part of water supply evaluations, especially for FHA-VA evaluations and wells serving public facilities where pump capacity is critical.

Pump Capacity Evaluation

1. Open the sampling tap near the pressure tank and drain water from the tank until pressure drops to the pump cut-in pressure, (Make sure no other water is being used in the building during the test.) On a submersible pump installation, it is often necessary to listen for a "click" in the pressure switch in order to signal the starting of the pump. Observe the pressure gauge and note the pump cut-in and cut-out pressures.

2. When the pump starts, immediately close the sampling tap and measure the length of time required for the pump to fill the pressure tank and shut off. The length of time between the pump cut-in pressure and cutout pressure is the *pump running time.*

3. After the pump stops, open the sampling tap and using a gallon container measure the volume of water that can be drained from the tank before the pump cut-in pressure is reached. When the pump starts, immediately close the tap and discontinue volume measurement. The volume of water measured is the *usable tank volume.*

4. Divide the usable tank volume by the pump running time to determine pump capacity.

   EXAMPLE
   Pump running time = 30 seconds or 0.5 minutes
   Usable tank capacity = 6.2 gallons
   Pump capacity = 6.2 gallons / 0.5 minutes = 12.4 gallons per minute

Pressure Tank Evaluation

By comparing the observed usable tank volume to the manufacturer's specifications for a particular model pressure tank, one can also determine if the pressure tank is functioning properly.

EXAMPLE
6.2 gallons of water were drawn from a 20 gal. hydropneumatic bladder type tank at an operating pressure of 30-50 psi. (Note: usable tank volume is inversely related to the operating pressure, i.e., if the operating pressure of the system is increased from 30-50 psi to 40-60 psi the usable tank volume will decrease.) By checking the manufacturer's data, we find that the total tank volume is 20 gallons and at a 30-50 psi setting, the tank should yield about 0.31 or 31 percent of its total volume as usable tank capacity. 20 gallons x 0.31 = 6.2 gallons. Since 6.2 gallons were withdrawn during the field test, it appears that the pressure tank is functioning in accordance with the manufacturer's specifications.